Be it known that Jai K. Baek has invented a new and useful

Boot Liner With Gel Pads

of which the following is a specification:

Field of the Inventions

The inventions relate generally to footwear, such as shoes, boots, boot liners, and specifically to ski boots or snow boarding boots designed to provide comfort and protection to the wearer by use of a gel pad in front of and above the toe and a gel pad behind the heel.

Background of the Inventions

Anyone who skis or snowboards has felt the pain of jamming their toes and heels against the inside of their boots. The boot described below provides a good solution to the problem.

Snowboard and ski boots are usually made of a combination of a boot liner and a boot shell. Though the boot liner may be made of various layers of foam, they don't absorb enough of the impact to alleviate the problem. The foam of the liner is typically so soft that it offers insufficient impact absorption. Essentially the skier's toes impact the outer shell with only a completely compressed layer of foam in between, which is painful and can cause injuries.

Kunesh, Two Ply Inflatable Sock, U.S. Patent 5,596,770, (Jan. 28, 1997), describes placing an adjustable air bladder partially filled with plastisol or hydrogel into the linings of a sock to increase comfort and reduce blisters. However, the sock described in Kunesh is too soft for use in a ski boot. To

control skis or a snowboard the wearer translates force through the boot to the skis or snowboard. The sock described in Kunesh would make ski or snowboard control difficult since it provides too much padding; essentially, the extra padding muffles the control force exerted by the wearer.

Wagonhurst, Size-Adjustable Footwear, U.S. Patent 6,082,027 (Jul. 4, 2000), describes the use of a releasably attachable foam insert to adjust the size of the inside of a boot. Wagonhurst seeks to find ways to accommodate different foot sizes with the same boot. Because Wagonhurst teaches the use of foam inserts to accommodate feet of different sizes, the inserts are designed to be compressible. Compressible liners become compressed in high impact environments and do not adequately protect a wearer's toes.

Summary

The boots described below alleviate the problem of pain and risk of injury during an impact while wearing a snowboard or ski boot. Placing a soft gel pad made of SBR or similarly resilient material between the foam and cloth layers forming the toe box provides substantial protection to the wearer's toes from impacts without reducing comfort or performance. To provide maximum protection the pad covers the entire front and top of the toe box. The pad fits snugly between foam layers of the toe box, or anywhere between the inner and outer cloth linings of the boot liner, and a glue further secures the pad within the cavity. The gel pad does not extend into the vamp or instep of the boot, so there is no deleterious effect on the transfer of force from the users foot to the boot as needed to control a ski or snowboard bound to the boot. Likewise, a gel pad is inserted in the boot liner in the heel counter area, providing protection from the impact of the wearer's heel with the heel counter area

of the boot, and the gel pad in the heel does not extend forwardly or upwardly into the ankle or arch areas of the boot to avoid mitigating the transfer of forces needed to control skis or snowboards.

Brief Description of The Drawings

Figure 1 is an overview of a boot liner disposed within an outer boot shell.

Figure 2 is a cross section of the boot liner showing a placement of the gel pads within the boot liner.

Figures 3 and 4 are views of the heel gel pad.

Figures 5 and 6 are views of the gel pad.

Detailed Description of the Inventions

Figure 1 shows an overview a boot **1** that includes boot liner **2** disposed within an outer boot shell **3**. The boot may be used as a ski boot, a snowboard boot, an ice skate boot, or any other kind of boot. The outer boot shell **3** may be provided with fittings to allow it to be removably attached to skis, a snowboard, or the like. The inner boot liner **2** is removably disposed within the outer boot shell **3**. Alternatively, the inner boot liner **2** is fixed within the outer boot shell **3**. The outer boot shell **3** includes an outer shell toe box **4**, the outer shell vamp **5**, the outer shell heel counter area **6**, the outer shell ankle area **7**, and the outer shell upper **8**.

Figure 2 is a cross section of a boot liner illustrating its components. An upper **9** and a sole **10** form the liner. The upper **9** includes a vamp **12**, a toe box **14**, a heel **15**, and a heel counter area **16**. Other areas of the boot include the arch area **18**, which corresponds to the arch of the foot, and the ankle

area, indicated by the phantom circle **19**, which corresponds to the area near the ankle bones of the wearer.

The vamp **12** is the portion of the boot liner upper near the instep of the boot, rearward of the toe box, and corresponding to the instep of the wearer, located posterior to the toe box **14**. The toe box **14** is that portion of the boot that accommodates the toes of the wearer. The heel counter area **16** corresponds to the back of the heel of the wearer and is the area where a counter is typically placed in or on shoes and boots to provide stiff support in the back of the shoe upper. The neck **11** has an opening extending rearwardly from the vamp **12**. The vamp **12** slopes downwardly towards either side of the boot in an arcuate path until each side meets the sole **10**. The sole **10** is disposed beneath the vamp **12** and the toe box **14** to form a foot-shaped cavity which accommodates the wearer's foot. The various portions of the boot liner may be stitched or sewn together, glued together, or formed integrally with each other.

The boot liner is composed of several layers of cloth, foam rubber, latex, and gel which vary in dimension and composition in different parts of the boot. Referring to the front of the boot, the toe box **14** is formed with four layers of cloth and foam, including a cover **20**, an outer foam layer **21**, an inner foam layer **22**, and a lining **23**. The cover **20** is a heavy cloth, such as mesh or fleece, but could also be cordura, plastic, synthetic leather, or action nubuck. The cover **20** may include several additional layers to create an outwardly attractive appearance. Preferably, when made in combination with all the specified elements of the boot liner, the foam layers **21** and **22** comprises polyethylene, but may also comprise ethyl vinyl acetate (EVA), latex, or polyurethane foam.

A gel pad **25** is disposed between the two foam layers of the toe box, secured by an adhesive. The gel pad **25** forms an arcuate path from the region forward of the vamp **12**, forwardly over the top of the toe box **14**, across the width of the toe box **14**, and to the bottom of the toe box at the sole **10**. The gel pad **25** extends around the tip of the toe box **14** laterally such that the entire front end of the toe box is protected by the gel pad **25**. The gel pad **25** is tapered at the edges and is thickest in the center, where the front of the toes would impact when the foot suddenly shifts forward in the boot. The gel pad **14** comprises styrene and 1,3-butadiene (styrene butadiene rubber, also referred to as SBR) or similar resilient soft rubber or elastomeric compound. The gel pad has an overall durometer value of less than 0 (Shore A).

Note that placing the gel pad **25** inside the foam layers of the toe box **14** tightly secures it, making slippage unlikely even under high impacts or high shear forces. In addition, by placing the pad **25** over the entire toe box **14** all parts of the toes are protected. If the toes jam forward during a high impact then the pad helps protect the joints and top part of the toes, even if the toes crumple around the joints.

Referring to the rear of the boot, the cover may be the same as the cover on the front of the boot. Disposed inside the outer cover **20**, and secured with a suitable glue, is an outer foam layer **21** made from ethyl vinyl acetate (EVA), latex, polyethylene or polyurethane foam. Preferably, when made in combination with all the specified elements of the boot liner, the outer foam layer **21** comprises polyethylene. Disposed inside the outer foam layer **21** is a middle foam layer **27** made from ethyl vinyl acetate (EVA), latex, or polyurethane foam, secured with a suitable glue to the outer cover. Preferably, when made

in combination with all the specified elements of the boot liner, the middle foam layer **27** comprises polyurethane foam. Disposed inside the middle foam layer **27** is an inner foam layer **22** made from ethyl vinyl acetate (EVA), latex, polyethylene, or polyurethane foam secured with a suitable glue to the middle foam layer. Preferably, when made in combination with all the specified elements of the boot liner, the inner foam layer **22** comprises polyethylene. Disposed inside the inner foam layer **22** is an inner lining **23**, made of spandex or low pile fabric, secured to the inner foam layer with a suitable glue. Inserted into the heel counter area **16** is a heel gel pad **30** composed of styrene and 1,3-butadiene (styrene butadiene rubber) with an overall durometer value of less than 0 (Shore A). The heel gel pad **30** is disposed between the inner foam layer **22** and the middle foam layer **27**.

Note that both the gel pad **14** and the heel gel **30** pad are beveled such that the upper and lower parts of the pads, as seen from the bottom of the heel to the top, are thicker than the central portion. This beveling provides maximum protection to the heel, yet minimizes the space required for the pad and provides for a smooth transition between padded and unpadded portions of the boot. It also tends to "hug" the heel and thereby increase comfort.

The overall durometer values of various locations on the boot may be adjusted to fall within certain parameters to maximize protection and comfort. All of the durometer values given in this specification were taken on a sample of a boot liner manufactured by the Applicant. The testing performed was to measure durometer (Shore) hardness per ASTM D 2240. The testing procedures were according to the ASTM D 2440-97^{el} test method.

The overall durometer value of the toe box **14** is, as measured from the inside of the boot to the outside, about 14 (Shore A) and in the range from about 7 (Shore A) to about 21 (Shore A). As measured from the outside of the boot to the inside the durometer value of the toe box **14** is 18 (Shore A) and in the range from about 9 (Shore A) to about 27 (Shore A).

The heel counter area **16** has an overall durometer value, as measured from the inside of the boot to the outside, of about 6 (Shore A) and in the range from about 3 (Shore A) to about 9 (Shore A). As measured from the outside of the boot to the inside the durometer value the heel counter area **16** is about 48 (Shore A) and in the range from about 24 (Shore A) to about 72 (Shore A).

At the ankle area **19** the overall durometer value, as measured from the inside of the boot to the outside, is about 6 (Shore A) and in the range of about 3 (Shore A) to about 9 (Shore A). As measured from the outside of the boot to the inside the durometer value at the ankle area is about 50 (Shore A) and in the range from about 25 (Shore A) to about 75 (Shore A).

At the center of the vamp **12** the overall durometer value, as measured from the inside of the boot to the outside, is about 9 (Shore A) and in the range of about 4 (Shore A) to about 13 (Shore A). As measured from the outside of the boot to the inside the durometer value of the vamp is about 17 (Shore A) and in the range from about 8 (Shore A) to about 26 (Shore A).

Figures 3 and 4 show the heel gel pad **30**. The heel gel pad **30** is shaped to afford protection to the back of the heel without making it so bulky as to cause discomfort to the wearer. The central contour line **36** shows where beveling begins. From

that point the heel gel pad **30** tapers until it reaches the pad edge **37**, which is thinner than the center of the pad **38**.

Figures 5 and 6 show the gel pad **25**. Like the heel gel pad **30**, the gel pad **25** is shaped to afford protection to the toes without making the boot so bulky as to cause discomfort to the wearer. The central contour line **39** shows where beveling begins. From that point the gel pad **25** tapers until it reaches the forward pad edge **40**, which is thinner than the center of the pad **41**. However, the gel pad is more pointed at the outer edges **42** to better fit the toe box. Thus, the flat pad edge **43**, also thinner than the pad center **41**, is more narrow than the rounded pad edge **40**.

While the gel pad **25** and heel gel pad **30** are shown embedded between the layers of the boot liner, they may be placed in other positions relative to the boot liner or boot liner layers. The gel pads for the heel **30** may be secured between the boot liner heel counter area **16** and the outer boot shell heel counter area **6**, or inside the boot liner heel counter area **16**. Likewise, the gel pad **25** for the toe may be secured between the boot liner toe box **14** and the outer shell toe box **4**, or anywhere between the various layers of the boot liner toe box **14**. The pad may also be secured to corresponding locations on the inside of the outer shell. However, placement of the gel pads **30** and **25** between various layers of the boot liner protects the pad itself from wear and tear during the use of the boot.

Thus, while the preferred embodiments of the devices and methods have been described in reference to the environment in which they were developed, they are merely illustrative of the principles of the inventions. Other embodiments and configurations may be devised without departing from the spirit of the inventions and the scope of the appended claims.